

REMARKS

The Office Action of March 28, 2003 has been received and carefully reviewed. By the above actions, claim 1 has been amended, and, therefore, claims 1-4 remain pending. In view of these actions and the following remarks, reconsideration of this application is requested.

With regard to the Examiner's objection to the drawing figures as failing to be properly labeled, the Applicant has filed on even date herewith a Letter Submitting Formal Drawings in which Figures 1-4 which have been properly labeled as required by the PTO-948 form attached to the Office Action. Therefore, it is respectfully requested that the objection to the drawings be withdrawn as being satisfactorily corrected.

With regard to the Examiner's rejection of claims 1-4, under 35 U.S.C. § 112 (second paragraph), as failing to particularly point out and distinctly claim the position of the cross-flow fan in relation to the laser chamber, the Applicant has amended claim 1 to clearly indicate that the cross-flow fan (3) is positioned within the laser chamber (1) as illustrated in Figure 1. In view of such an amendment, the relationship of the cross-flow fan, for circulating the lasing gas, relative to the main electrodes (also positioned within the laser chamber) has been clearly set forth such that one of ordinary skill in the art would realize the Applicant had possession of the subject matter of claim 1 at the time of the invention. Withdrawal of the § 112 (second paragraph) rejection is, therefore, respectfully requested.

Further, with regard to the Examiner's rejection of claims 1-4, under 35 U.S.C. § 103(a), as being obvious in view of the teachings of the Hoffman et al ('537), the Applicant respectfully traverses this rejection.

The currently claimed invention is drawn to the recognition by the inventor that a stable operation at a repetition rate of 4kHz is only possible when both the number of rotations of the fan blade, i.e., peripheral speed, and the fan diameter are selected to avoid the downstream arcing in the laser chamber. Such a discovery is clearly discussed in the specification, beginning at page 4, lines 5-16, and continuing at page 5, line 16, to page 6, line 16, as well as being illustrated in Figure 2.

With regard to the Examiner's rejection of claims 1-4 in view of the teachings of Hofmann et al. (US 6,018,537), this document teaches a narrow-band high rep rate F₂ laser

for permitting integrated circuit resolution which is not available with KrF and ArF lasers. The patentees (see column 3, lines 4-5) disclose a repetition rate of 1000 to 4000 Hz is preferred for the embodiments of the invention. That is, formally, there is an overlap with the claimed invention in regards the 4 kHz operation of the laser device. However, a detailed review of Hoffmann et al. reveals that the patentees do not teach any of the particularly claimed parameters regarding the cross-flow fan and further the patentees do not teach a relation of those parameter to the avoidance of downstream arcing in the laser chamber. That is, Hoffmann et al. does not teach a specific diameter of the cross-flow fan and the peripheral speed thereof (see column 8, lines 19-35); whereas, the present claim 1 specifies those parameters to be 150 mm or less and 25.0 m/s or more, respectively.

These deficiencies of Hoffmann et al. are recognized by the Examiner in the Office Action. The Examiner attempts to remedy the deficiencies of Hoffmann et al by stating that a person of ordinary skill in the art could have found those values by simple experimentation to find the optimum values for operation, citing *In re Aller*, 105 USPQ 233. In a further attempt to establish that the particularly claim parameters of fan diameter and peripheral speed are recognized as result-effective variables, the Examiner also references the discussion of the prior art in the instant application, pages 1-2, where the increase of the flow speed of the circulated gas by increasing the rotations of the fan is mentioned.

In rebuttal, the Applicant asserts that Examiner has mistakenly applied the above case law and further that the reliance on *In re Aller* to establish obviousness is erroneous. As the Examiner is aware, MPEP Chapter 2144.08(II)(A) and (B) notes is discussing the *Aller* and other decisions relating to optimization of variables that:

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieved a recognized result, before a determination of the optimum or workable range of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F2d 618, 195 USPQ 6 (CCPA 1977) (emphasis added)

Applying this principle to the instant claims, the Applicant notes that there is no discussion the prior art of the instant application of a relationship between fan diameter and peripheral speed which results in an improvement (decrease) in the downstream arcing problem also mentioned in the prior art. Further, at page 2, fifth paragraph 5, it is also stated, that a mere increase of the number of rotations of the fan as proposed in the prior art could

not provide the desired stable laser operation at 4 kHz or more. Additionally, as disclosed at page 6, third paragraph, of the specification, the inventor has discovered that vibrations are generated which lead to a deterioration of the degree of wavelength stability when the number of rotations is unnecessarily high. This discovery is clearly illustrated in Figures 3 and 4 in connection with the discussion of the invention at pages 7-8 of the specification. Simply put, the problem of providing a stable laser operation (reduced arcing) at a repetition rate of 4 kHz or more cannot be solved by just increasing the rotational speed of the fan. It is the inventor who has recognized that a stable operation at a repetition rate of 4kHz is only possible when both the number of rotations of the fan blade, i.e., peripheral speed, and the fan diameter are selected to avoid the downstream arching in the laser chamber.

Particular note is made of the Examiner's further attempt to remedy the deficiencies of Hoffman et al by the assertion that one of skill in the prior art, alleged to be the prior art of blowing fans such as airplane rotors or air conditioner fans, would vary (increase/decrease) both the fan power and diameter of the fan blade to achieve the desired result. However, such an assertion appears to be wholly improper hindsight which cannot be employed for the purpose of asserting the obviousness of the claimed invention, see MPEP Chapter 2143.01.

In rebuttal of this later assertion by the Examiner, the Applicant would point out that the Examiner has provided no teaching, i.e., either factual evidence or detailed scientific reasoning, that both the "fan power" and fan "diameter" are inter-related with regard to any downstream (electrical) property of a gas of any type as presently disclosed, and further, the Applicant's prior art (see page 2 of the instant specification) only teaches that there is an appreciation of the fact that a non-uniform lasing gas can result in an undesirable arc discharge in the laser chamber, and further that the mere increase of the number of rotations of the fan (fan speed) could not provide the desired stable laser operation at 4 kHz or more. In light of these failings, there is no motivation provided by the prior art to suggest the relationship between fan speed and fan diameter as presently set forth or suggest a modification of the fan parameters of Hoffmann et al. to achieve the parameters instantly claimed.

Further, there are dozens of parameters related to the flow speed in a laser chamber which are not related to the fan itself. Some of the possibilities of increasing the flow speed

are mentioned in the present description, such as varying the electrode distance, changing the geometry of the laser chamber and so on. Adapting the fan itself also opens numbers of possibilities. In this regard, Hoffmann et al. teach to provide a fan with an unsymmetrical blade design (see column 8, lines 19-35), but the patentees are absolutely silent as to the diameter of the fan. Therefore, based upon the teachings of Hoffmann et al., one of ordinary skill in the prior art would have varied the geometrical design of the blades in order to solve the resonance effects, recognized by Hoffman et al., as being related to rotating frequency of the fan.

In light of the teachings of the Applicant's prior art regarding fan speed alone not preventing downstream arcing, the Applicant also asserts that it is unlikely that the laser device of Hoffmann et al. will actually lead to operation at repetition rates of 4 kHz or more. Particular note is made of the fact that Hofmann et al. only disclose experimental data relating to a repetition rate of no more than 2000 Hz. For example, Figure 10A shows experimental results with a prototype unit up to a repetition rate of 2000 Hz. As can be seen from the lower diagram of Figure 10A, the energy drops down from 12 mj at 1000 Hz to 10 mj at approximately 2000 Hz. Hoffmann et al. (column 23, lines 19-21) states this energy decrease of nearly 17% is called "a slight drop off of pulse energy". These results provide a clear indication to one of ordinary skill in art that the excimer laser device disclosed by Hofmann et al. is not capable of operating at repetition rates of 4000 Hz or more with a reasonable energy output.

To summarize, in contrast to the presently claimed invention, neither the Examiner or the Hofmann et al. reference provide any hint whatsoever with regard to the disclosed relationship of the diameter of the fan and fan speed, each cooperating as result-effective variables, which effect the downstream arcing in the laser chamber. Without this recognition by Hoffman et al., the Applicant asserts that the Examiner has incorrectly applied the principles established by both *In re Aller* and *In re Antonie*, and therefore, a *prima facie* case of obviousness has not been established by the citation of the Hoffmann et al. reference. Consequently, the rejection of claims 1-4, under § 103(a), is improper and must now be withdrawn.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with Applicant's representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Lastly, it is noted that a separate Extension of Time Petition (one month) accompanies this response along with a check in payment of the requisite extension of time fee. However, should that petition become separated from this Amendment, then this Amendment should be construed as containing such a petition. Likewise, any overage or shortage in the required payment should be applied to Deposit Account No. 19-2380 (740145-193).

Respectfully submitted,

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